Report on SNS RFQ Status

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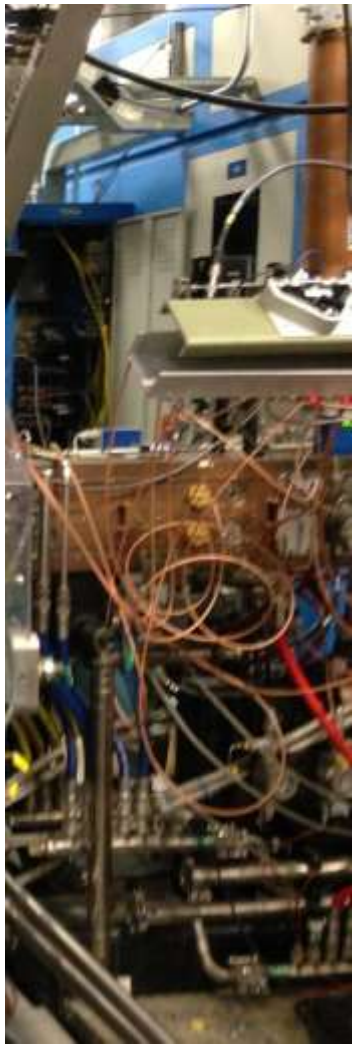
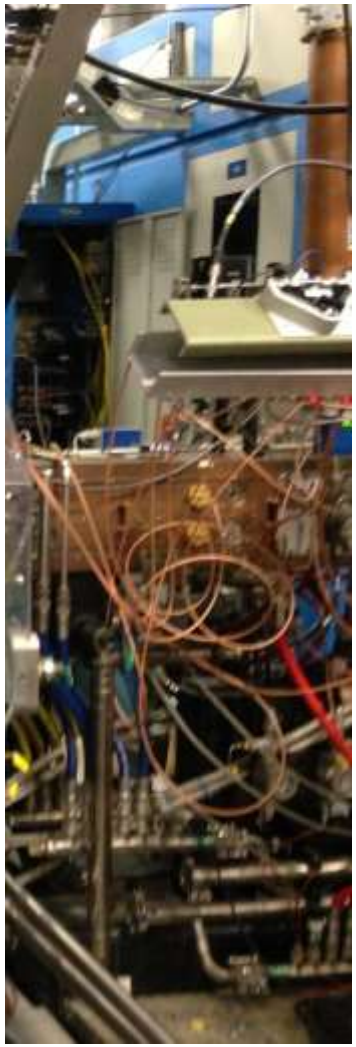
SNS Operational RFQ



- PXIE RFQ design is based from this RFQ.
- Two jumps in resonant frequency required retuning (one jump was 420 kHz and one jump was 260 kHz).
- Both jumps happened after water system incidents.
- Another drop in transmission efficiency required RFQ retuning (~20% field variation measured).
- Cause of drop is still unknown.
- Field variation is now checked twice a year using field pickup loops.
- All pickup loops are connected through a series of mechanical RF switches. Eight can be monitored simultaneously.

SNS Operational RFQ 2

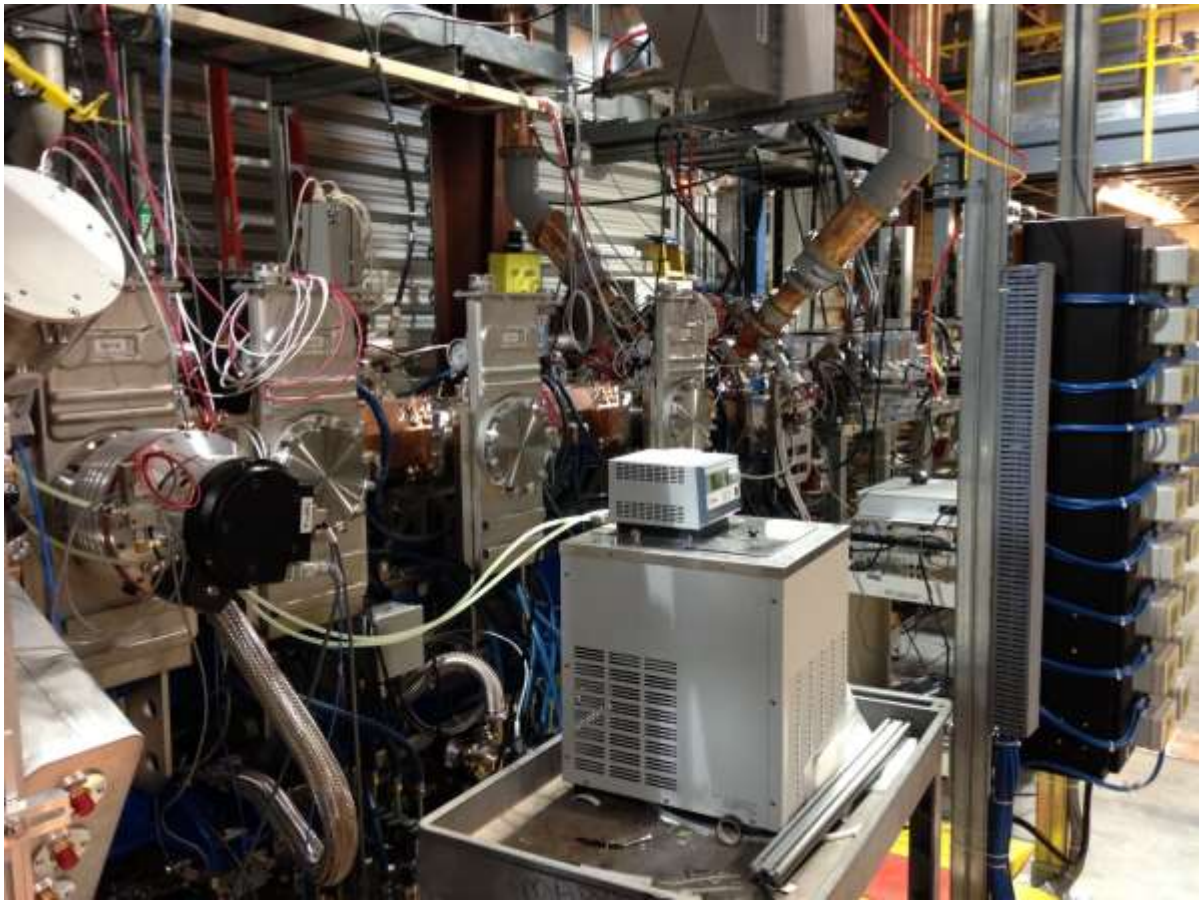


- This RFQ still has a tuning instability suspected to be caused by beam impact.
- This was remedied by including RF pulse width variation in resonant control loop, but still limits average current through RFQ.
- Beam transmission monotonically increases with RF power.

RFQ Chiller System

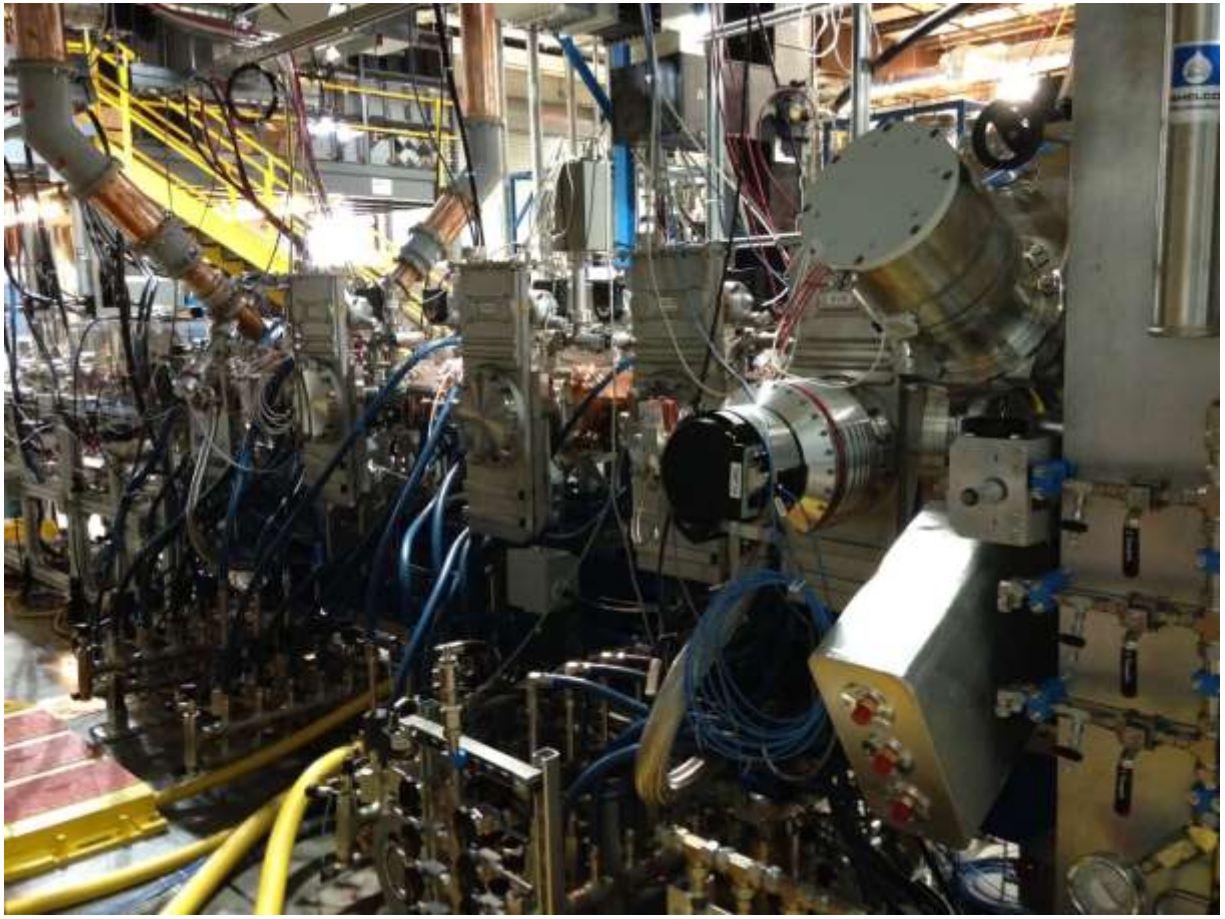
- Cooling of RFQ done with closed loop Glycol systems.
- Body and vane loops are independently controlled.
- Temperature stability is 0.1°C and response time is 1-2 minutes.
- A spare unit is kept close for quick exchange.

New SNS RFQ



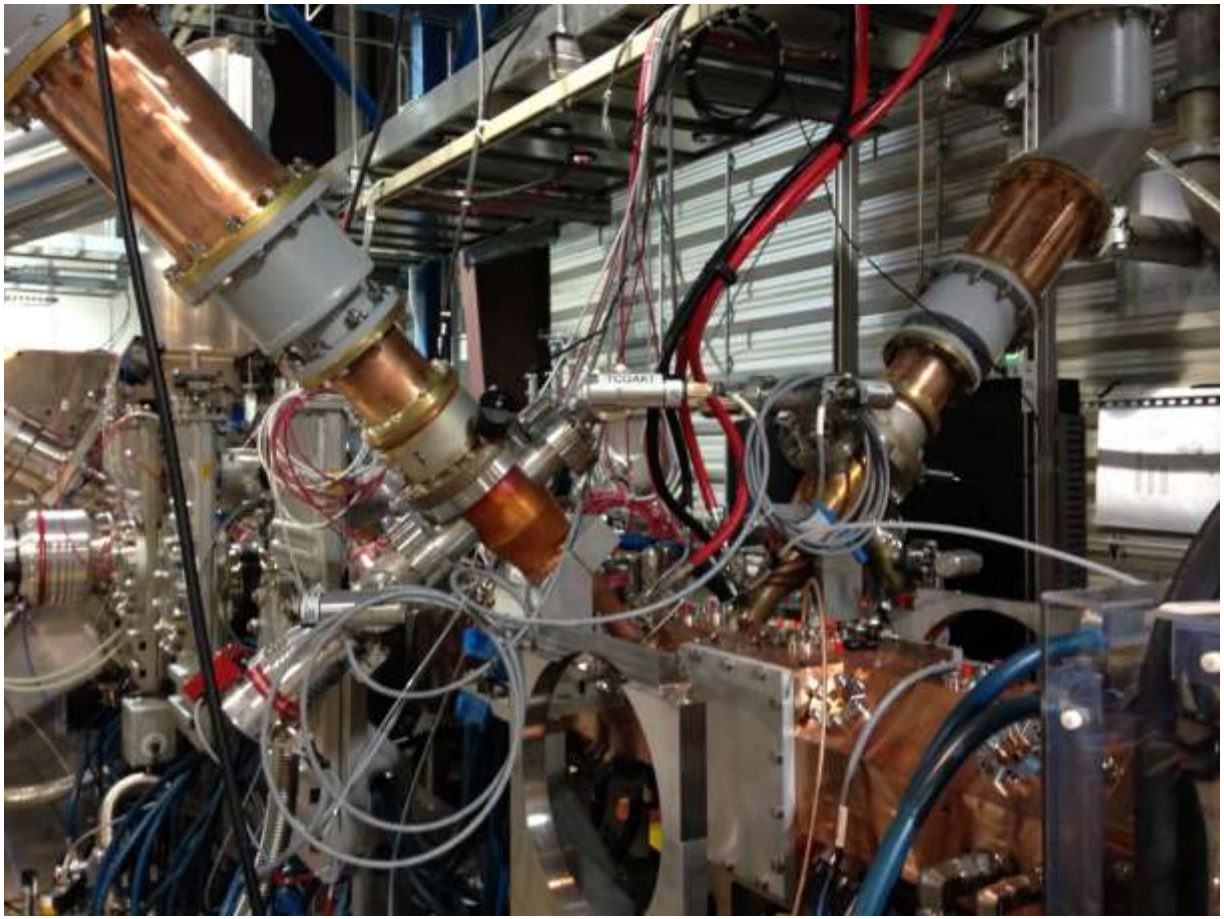
- Designed and manufactured by Research Instruments RI, Germany.
- Vane profile same as operational RFQ, but cavity design is different.
- Mode separation performed by rods at cutbacks only.
- Will be used as experimental line until operational RFQ fails.
- Vacuum pump plans include 4 turbo and 4 cryo
- Every pump has a vacuum valve for protection.

New SNS RFQ 2



- RFQ power comes from 405 MHz klystron.
- This RFQ will also be tuned by dedicated water chiller loops.
- They will use x-ray spectrum from vacuum window to measure internal field.
- Toroid system designers say they only know transmission efficiency of operational RFQ to 10% level.

New RFQ Input Couplers



- Antenna is water cooled with option to water cool ceramic window.
- Each coupler equipped with turbo pump, ion pump, and ion gauge.
- First coupler failure after 6 years of operation, suspected due to vacuum contamination.